

Reducing the Cost of Spacecraft Ground Systems and Operations
Rutherford Appleton Laboratory
27-29 September, 1995

Abstract for

“Cost-Effective Space Mission Operations”

Overview:

1. Introduction to Cost-Effective Space Mission Operations
- Dr. Wiley J. Larson, United States Air Force Academy
2. Functions **Performed** by Mission Operations
- **Mr.** Gael Squibb, Jet Propulsion **Laboratory**
3. Developing a Mission Operations Concept
- Dr. **Daryl** G. Boden, United States Air Force Academy

We propose the series of three presentations described above for inclusion in your symposium. These presentations are similar to those we presented last November in a plenary session at the Third International Symposium on Space Mission Operations **and** Ground Data Systems. Each presentation lasts 40 minutes and the presentations are designed to be given in order. The information in our presentations is extracted from a book of **the** same title scheduled for publication in August, **1995**. Please note that **since** we have a book covering this topic, we will not prepare separate papers. An overview of each presentation is shown below.

I. Introduction to Cost-Effective Space Mission Operations

- Dr. Wiley J. Larson, United States Air Force Academy

A. Trends **observed** in space programs and space mission operations **with** emphasis on reducing cost and complexity of space mission operations.

B. Space Mission Analysis and Design Project

1. **Improve** communication within space community.
2. Enhance education and performance of users, designers, **and** operators of space missions.

C. Description of space mission concepts and space mission architectures.

1. How we get from a mission objective to a mission concept,
2. Description of mission elements that makeup a space mission architecture.

D. Process for developing a space mission concept with emphasis on mission operations element.

1. Determine mission objectives, mission requirements and constraints, and type of mission.
2. Develop alternative mission concepts.
3. **Identify** and perform key trades among mission elements and organizations.
4. Characterize acceptable mission concepts and associated mission architectures.
5. Select a baseline mission concept.
6. Develop alternative mission operations concepts to support mission concept,
7. Develop a mission operations plan and allocate resources.
8. Assess mission utility and life-cycle costs.
9. **Iterate** and **document**.

E. Example

II. Functions Performed by Mission Operations

- Mr. Gael Squibb, Jet Propulsion Laboratory

A. Definition of a Mission operations System (**MOS**)

1. Data systems (ground and spacecraft).
2. Operations organization.

B. MOS Functions - including information required, products generated, and key considerations for each function.

1. Mission Planning
2. Activity Planning
3. Mission Control
4. Data Transport and **Delivery**
5. Navigation Planning and Analysis
6. Spacecraft Planning and Analysis
7. Payload Planning and Analysis
8. Payload Data Processing
9. Archiving and Mission Data Base
10. Systems Engineering, Integration, and Test
11. Computer and Communication Support
12. Development and Maintenance Support
13. Management

C. Relative cost of performing each **function**.

III. Developing a Mission Operations Concept

- **Dr. Daryl G. Boden**, United States Air Force Academy

A. Definition of a Mission Operations Concept (**MOC**)

B. Information required to develop a MOC.

C. Process for developing a MOC

1. Identify mission concept and supporting space mission architecture.
2. Determine mission operations **functions** to be performed.
3. **Identify** options for accomplishing **functions**.
4. Perform trades for accomplishing **functions**
5. Develop operations scenarios
6. Develop **timelines** for scenarios
7. Determine resources needed for each scenarios.
8. Develop data flow diagrams
9. Characterize the mission operations organization
10. Asses mission utility, complexity, and cost of operations.
11. **Identify** derived requirements,
12. Document and iterate.

D. Contents of a MOC document.